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ANATOMICAL AND NOMENCLATURAL NOTES ON OPOSSUMS

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From the time that specimens of different species of didelphids became available to zoologists there has been confusion concerning which names to apply to the various genera and species. Uncertainty in regard to the presence or absence of a pouch in the different forms still persists also. This paper attempts to clear up much of this confusion.

My investigations as outlined below show that the brown four-eyed opossum (currently called *Metachirus nudicaudatus*) totally lacks a pouch. Other characters of this species are pale-colored spots above the eyes, a basically reddish-brown coloration dorsally and little extension of fur onto the base of the tail.

The gray and black four-eyed opossums (now called *Philander opossum* and *Philander mcilhennyi* respectively) possess fully developed pouches, also have pale spots above the eyes, have basically gray or blackish coloration dorsally and show considerable extension of fur onto the base of the tail.

The generic epithet *Philander* Tiedemann will be shown to apply to the brown four-eyed opossum. This makes *Metachirops* Matschie the proper generic epithet for the gray and black four-eyed opossums.

Seba (1734) described and figured opossums designated *Philander, Opassum, sive Carigueja, Brasiliensis*; *mas* and *Philander, Americanus, seu Carigueja, cum catulis, saccum ventris intrantibus*; *foemina.* The description of the male animal reveals that the opossum in question has light tawny spots above the eyes and that fur of this color also covers the area

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around the mouth, the ventral surface, the legs and the feet. The upper parts of the body are dark chestnut and the tail is covered with hair for a distance equal to the length of a human finger. No description of coloration is given for the female but the pouch is illustrated and amply described. The copy of the Latin-French edition of Seba available to me has uncolored plates but (Mrs.) Ruth M. Farrow (personal communication) has informed me that the coloration of both the male and female opossums in a Latin-Dutch edition of Seba at McGill University essentially agrees with the description given for the male.

Based on the coloration alone, the descriptions and figures would leave no doubt that the animal in question is the brown four-eyed opossum—the one currently known as *Metachirus nudicaudatus* (É. Geoffroy St.-Hilaire). The extent of the hairy covering as described on the tail of the male, and the presence of a pouch (figured as containing three young) in the belly of the female argue against this determination, however.

Although other authors have stated that the brown four-eyed opossum does not have a pouch, Enders (1935, 1937a, 1937b) claimed that old females at least have well-developed pouches. Examination of thawed lactating specimens with young in place sent to the National Museum of Natural History have convinced me that brown four-eyed opossums, young or old, lack a pouch. Enders (personal communication) has recently informed me that he is now convinced that the specimens he based his conclusions on were woolly opossums (*Caluromys* J. A. Allen) although this does not seem to be the case with his (1935) observations on Barro Colorado Island. Unfortunately, Enders' specimens have been discarded and cannot have their identifications checked. Statements have appeared in the literature to the effect that *Caluromys* lack pouches. Dilford C. Carter (personal communication) has informed me that in *Caluromys derbianus* (Waterhouse) at least, full pouch development does occur and this appears to be borne out upon examination of dry skins. There is apparently considerable interspecific variation in this regard, however. Living and freshly killed examples of *Caluromys philander* Linnaeus which I examined at Belém, Pará, Brazil

possessed rudimentary lateral abdominal folds as the only indication of pouch development. Old lactating individuals might have shown less equivocal pouch development than the individuals I have examined, however. Carter's and my findings support statements made by some (but not all) authors concerning differences in pouch development in *Caluromys*. As recently as 1941, Gilmore recognized the subgenus *Mallodelphys* Thomas (which Gilmore and other authors have misspelled "*Mallodelphis*") containing "*Caluromys laniger*" [= *C. lanatus* (Illiger)] and "[*Caluromys*] *derbiana*" [= *C. derbianus* (Waterhouse)] and stated it is characterized in part by a fully developed pouch. Miranda-Ribeiro (1936) regarded *Mallodelphys* as a full genus. Tate (1939) stated *Mallodelphys* and *Caluromys* "appear to be definitely congeneric" and wrote "In both the pouch is reduced to simple lateral folds . . ." These statements influenced Cabrera (1957) to not recognize *Mallodelphys* even as a subgenus. Gilmore's view that *Mallodelphys* is worthy of subgeneric recognition is probably correct.

Absence of a pouch in the brown four-eyed opossum provides evidence for my view that it is not as closely related to the gray four-eyed opossum as the latter is to the animals now known as *Didelphis*. Cranial characters seem to support this view also. Now that the genus containing the gray four-eyed opossum has been shown to be polytypic (Gardner and Patton, 1972) some zoologists may take my suggestion (1972) that this genus might be "lumped" with *Didelphis* (in the current sense) somewhat less seriously. Certainly subgeneric separation (at least) seems called for.

Although the brown four-eyed opossum lacks a pouch, this animal has been figured as possessing a structure which could be interpreted as a pouch. Schreber (1778, pl. CXLVI. B.) depicted an animal called "*Didelphys Opossum* Linn. femina." The pose is calculated to show the belly which displays a dark brown streak which is probably meant to represent a pouch. Actually, specimens of both male and female brown opossums may show a midventral streak on the belly. In stuffed skins of females this may be caused by stitching bringing the sides of the dark mammary region close together.

In males, at least, it is caused by a secretion from a midventral gland. In an adult male I examined in the Canal Zone I found this elongate, relatively dark-colored, somewhat teardrop-shaped gland (with the blunt end anterior) was about 80 mm. long with its anterior end corresponding in position with the posterior end of the sternum. The greatest width was about 13 mm. The secretion of the gland had stained the overlying skin with an orangish color, had stiffened the overlying hairs and stained them a buffy orange. The secretion had a (to me) extremely strong and disgusting odor. A second gland was present on the throat. This gland, about 26 mm. anterior to the larger midventral gland terminated anteriorly at the level of the anterior end of the sternum. The throat gland was paler than the inside surface of the skin, about 28 mm. long and about 6 mm. wide. The skin over this gland was completely or nearly hairless. The dark-colored groin glands were similar to those found in the gray four-eyed opossum and *Didelphis marsupialis* Linnaeus. I have not had the opportunity to investigate the nature of these glands in females since I became aware of their existence in males.

Glandular secretions cannot explain the appearance of the unequivocal pouch shown in Seba's figure of the female brown opossum. The identities of Seba's opossums have some importance from a nomenclatural point of view because Linnaeus (1758) gave Seba as the only authority for his description of *Didelphis Opossum*. The actual description given by Linnaeus most closely fits the common gray four-eyed opossum or else the animal named *Philander mcilhennyi* (the black four-eyed opossum) by Gardner and Patton (1972). Specimens of the latter, however, are much less likely to have reached Europe in the eighteenth century and for this reason and reasons of nomenclatural stability it is best to regard Linnaeus' *Didelphis Opossum* as being the common gray four-eyed opossum. The combinations of characters described and figured by Seba fit no known opossums and the identity of his material will almost certainly remain unknown (assuming it does not represent an unrecognized species). The identity of *Philander* Tiedemann (1808), however, still presents resolvable problems which will be dealt with below.

In 1698, Tyson discussed the anatomy of a female opossum [which must have been the animal now known as *Didelphis marsupialis virginiana* (Kerr)] from Virginia and in 1704, Cowper described the anatomy of a male opossum from Virginia.

Buffon (1763) discussed the "sarigue" or "opossum." Buffon concluded, in effect, that all of the earlier references dealing with the larger sorts of American opossums referred to one and the same animal. Buffon's "sarigue" is therefore a composite involving *Didelphis*, possibly the brown four-eyed opossum and probably the common gray four-eyed opossum as well. The "sarigue" of Daubenton (1763) in the succeeding pages is also a composite. The coloration as given in the text seems to resemble that of the brown four-eyed opossum most. The length of the haired portion of the tail as described and figured is most like that of the common gray four-eyed opossum and the proportions of the male shown in plate 45 resemble those of the latter more than they do those of the brown four-eyed opossum. Judging from its shape and the large measurements given for it, the skull figured on plate 51 must be that of a *Didelphis*.

Schreber (1778) gave an account of "*Didelphys Opossum* . . . LINN." Schreber's synonymy includes names for opossums of several genera. His written description, however, gives the coloration diagnostic of the brown four-eyed opossum and his figures of both sexes also show the same coloration. The bodily proportions and distribution of hair on the tail in the figure of the male correspond to those of the gray four-eyed opossum. The female figured has the bodily proportions of the brown four-eyed opossum and the tail, which is long, slender, uniformly pale-colored and ventrally naked to its base unequivocally confirm this identification. As discussed above, the brownish midventral line on the abdomen which might be interpreted as the opening of a pouch could be explained in another way. Schreber gave the geographic range of the animal in question as including Brazil, Perú, Guiana, México, Florida, Virginia and the Antilles, which reflects the confusion concerning the identity and zoogeography of the larger opossums at that time.

In 1808, Tiedemann described the genus *Philander* (which he attributed to Brisson, 1762) and listed "Das Virginische Opossum. P. virginianus (Did. opossum L.)" as the first species of the genus to be dealt with. No authority is given for the name *P. virginianus* and there is therefore no particular reason to assume that this is not a new name attributable to Tiedemann rather than a citation of Kerr's (1792) name *Didelphis virginiana.* Tiedemann indicated that "Das Virginische Opossum" is the same species as those mentioned by Tyson (1698), Cowper (1704), Buffon (1763), and Schreber (1778). He gave the range as "Virginien, Mexico, Peru u.s.w." All of this indicates a composite creature but his description of the animal he had in mind ("Körper röthlich braun. Ueber jedem Auge ein gelblich weisser Flecken.") can only refer to the brown four-eyed opossum.

Burmeister (1856) coined the epithet *Philander* (a junior homonym of *Philander* Tiedemann) to refer to the woolly opossums (now known as *Caluromys* Allen). Thomas (1888) attributed the original authorship of the epithet *Philander* to Tiedemann but regarded Burmeister's erection of the homonym *Philander* as a restriction of *Philander* Tiedemann to include only the woolly opossums. This interpretation is incorrect. Burmeister clearly indicated that he was to be considered as author of the epithet *Philander.* In addition, the woolly opossums were not specifically mentioned as being included in the genus *Philander* by Tiedemann.

In 1900, Rehn concluded that *Didelphis opossum* Linnaeus should be the type-species of *Didelphis* Linnaeus and stated that the proper generic epithet for the larger opossums (presently called *Didelphis*) was *Sarigua* Muirhead.

In 1900, Allen claimed that the epithet *Philander* should not be used for any of the opossums. Allen credited the name to Brisson (1762). Since the specific contents of *Didelphis* Linnaeus and *Philander* Brisson were essentially the same, Allen suggested that *Philander* be merely regarded as a junior synonym of *Didelphis* and should be abandoned. Allen claimed that *Philander* Tiedemann should be abandoned for the same reasons. Allen's contention that *Philander* Tiedemann as originally conceived was a mere synonym of *Didelphis* (in

the old sense of including all the opossums) and had the same specific contents was more or less correct. This is clearly indicated by Tiedemann's statement that the genus included "*gegen 10 Arten.*" For some reason, Tiedemann listed but three of these, one, the brown four-eyed opossum, a *Marmosa* and a *Monodelphis*. Another claim made by Allen was that *D.[idelphis] opossum* is the type-species of *Metachirus*. In this he was in error. In the original description of *Metachirus* (Burmeister, 1854) the specific epithet *opossum* does not appear [although *opossum* is included in *Metachirus* along with *myosuros* and *quica* in Burmeister (1856) and is the first-listed species]. Only two species are mentioned, *myosuros* Temminck and *quica* Temminck. As *myosuros* is the first mentioned, it should be regarded as the type-species (as has been done by a number of authors). It is of interest that Temminck (1824) described *myosuros* as having a fully developed pouch.

In 1916, Matschie erected the genus *Metachirops* for the common gray four-eyed opossum. The first (on p. 262) species specifically referred to the new genus was *Didelphis quica* Temminck. Matschie regarded *Philander* Tiedemann as a synonym of *Didelphis* Linnaeus.

Cabrera (1919) erected the generic epithet *Holothylax*. It is obvious that the name was intended to apply to the common gray four-eyed opossum. Cabrera cited *Didelphis opossum* Linnaeus as the type-species. Cabrera treated *Philander* Tiedemann as a senior synonym of *Caluromys* J. A. Allen. An entertaining discussion of the origin of the term "*Philander*" may be found in Cabrera and Yepes (1940).

Tate (1939) maintained that Tiedemann's *Philander virginianus* was a *Didelphis* (as in current usage). He also declared that *Didelphis* Linnaeus and *Philander* Brisson were not synonyms. He indicated that if Brisson's names were available then *Philander* was the proper generic epithet for the common gray four-eyed opossum.

Gilmore (1941) stated the name *Philander* should date from Brisson (1762) and that the name was applicable to the common gray four-eyed opossum.

Hopwood (1947) pointed out that *Philander* Brisson (1762)

is not available owing to the non-binomial nature of Brisson. He also pointed out that names dating from Brisson (1762) are not available in any event owing to the fact that the latter work is essentially a reprint of Brisson (1756) and should, therefore, be regarded as pre-Linnaean. Hopwood thought that the name *Philander* should date from Gronovius, 1763 (which I have not seen). Hopwood followed Thomas (1888) in regarding *Didelphis philander* Linnaeus as the type-species of *Philander* Tiedemann and designated *Didelphis philander* as the type-species of *Philander* Gronovius.

In 1949, Hershkovitz concluded the name *Philander* Tiedemann should be applied to the common gray four-eyed opossum. No reasons were given for this action—it was merely stated that this was clearly the obvious course to take if one reads Tiedemann's description and synonymy. In spite of this, subsequent authors have followed Hershkovitz. Concerning the type-species of *Philander* Tiedemann, Hershkovitz wrote "As *P. virginianus* is virtually tautonymic [?], it is here designated genotype of *Philander* Tiedemann." He pointed out that since the names of Brisson *and* Gronovius are unavailable, the earliest authorship for *Philander* is that of Tiedemann.

Owing to the fact that the generic epithet *Philander* Tiedemann 1808 has not been applied to the proper animal (namely, the one presently known as *Metachirus nudicaudatus*) but has been applied in a most confusing manner to a number of different kinds of animals it would probably be best if it be suppressed. If this course of action meets with approval, a formal proposal will be drawn up for consideration by the International Commission on Zoological Nomenclature.

Metachirops Matschie 1916 is the proper generic epithet for the gray and black four-eyed opossums. Although Hershkovitz (1949) stated that *Didelphis opossum* Linnaeus was the type-species of *Metachirops*, *D.[idelphis] quica* was the only species mentioned on the occasion of the first proposal of the name (Matschie, *op. cit.*, p. 262). On p. 268, Matschie listed nine specific epithets to go with his *Metachirops*. One of these (the fifth) is *opossum*. Since I have been unable to find a formal proposal of a species to be regarded as the type-species

of *Metachirops* and all evidence points to *quica* as being the most reasonable species to be so designated, *Didelphis quica* Temminck (1824) is here declared to be the type-species of *Metachirops* Matschie. In this regard, it should be noted that Hall and Kelson (1959) listed *quica* as the type although without explanation. Since the name *Metachirops* came into rather general use for the gray four-eyed opossum prior to Gilmore (1941) this name is the most desirable epithet for this animal for reasons other than sheer "legality."

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Literature Cited

Allen, J. A. 1900. Note on the generic names *Didelphis* and *Philander*. Bull. Amer. Mus. Nat. Hist. 13:185–190.

Brisson, M. J. 1756. Regnum animale in classes IX distributum, sive synopsis methodica sistens generalem *animalium* distributionem in classes IV, & duarum primarum classium, *quadrupedum* scilicet & *cetaceorum*, particularem divisionem in ordines, sectiones, genera & species. C. J. B. Bauche, Paris:i–vi, 1–382.

———. 1762. Regnum animale in classes IX distributum, sive synopsis methodica sistens generalem *animalium* distributionem in classes IX, & duarum primarum classium, *quadrupedum* scilicet & *cetaceorum* particularem divisionem in ordines, sectiones, genera & species. Theodorum Haak, Lugduni Batavorum:1–7, 1–296.

Buffon, G. L. L. de. 1763. Le sarigue *ou* l'opossum. *In* Buffon, G. L. L. de and L. J. M. Daubenton. Histoire naturelle générale et particuliére, *avec la description* du cabinet du roi, Vol. 10, l'imprimerie royal, Paris:279–310.

Burmeister, H. 1854. Systematische Uebersicht der Thiere Brasiliens, welche während einer Reise durch die Provinzen von Rio de Janeiro und Minas geraës gesammelt oder beobachtet wurden

von Dr. Hermann Burmeister. I. Verlag von Georg Reimer, Berlin:i–x, 1–341.

Burmeister, H. 1856. Erläuterungen zur Fauna Brasiliens, enthaltend Abbildungen und ausführliche Beschreibungen neuer oder ungenügend bekannter Thier-Arten. Georg Reimer, Berlin: i–viii, 1–115, 32 pls.

Cabrera, A. 1919. Genera mammalium. Monotremata, Marsupialia. Mus. Nac. Cienc. Nat., Madrid:1–177, 1 unnumbered page, 17 pls.

———. 1957. Catálogo de los mamíferos de America del Sur. Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigación de las Ciencias Naturales, Ciencias Zoológicas 4:i–iv, 1–307.

Cabrera, A., and J. Yepes. 1940. Historia natural Ediar. Mamíferos sud-americanos (vida, costumbres y descripción). Compañia Argentina de Editores, Buenos Aires:1–370, 78 pls.

Cowper, W. 1704. A letter to Dr Edward Tyson. Giving an account of the anatomy of those parts of a male opossum that differ from the female. Philosophical Transactions 24(290):1576–1590.

Daubenton, L. J. M. 1763. Description du sarigue. *In* Buffon, G. L. L. de, and L. J. M. Daubenton. Histoire naturelle, générale et particuliére, *avec la description* du cabinet du roi, Vol. 10, de l'imprimerie royal, Paris:311–334, 7 pls.

Enders, R. K. 1935. Mammalian life histories from Barro Colorado Island, Panama. Bull. Mus. Comp. Zool., Harvard, Cambridge, Mass. 78(4):385–502, 5 pls.

———. 1937a. [Review of] Miranda-Ribeiro, Alipio de. Didelphia ou mammalia-ovovivipara. J. Mamm. 18:108–109.

———. 1937b. Panniculus carnosus and formation of the pouch in didelphids. J. Morph. 61(1):1–26.

Gardner, A. L., and J. L. Patton. 1972. New species of *Philander* (Marsupialia:Didelphidae) and *Mimon* (Chiroptera:Phyllostomidae) from Peru. Occ. Papers Mus. Zool. Louisiana State Univ. 43:1–12.

Gilmore, R. M. 1941. Zoology. *In* Bugher, J. C., *et al.*, The susceptibility to yellow fever of the vertebrates of eastern Colombia. I. Marsupialia. Am. J. Trop. Med. 21(2):314–319.

Hall, E. R., and K. R. Kelson. 1959. The mammals of North America. Vol. I. Ronald Press Co., New York:i–xxx, 1–549, 1–79.

Hershkovitz, P. 1949. Generic names of the four-eyed pouch opossum and the woolly opossum (Didelphidae). Proc. Biol. Soc. Wash. 62:11–12.

Hopwood, A. T. 1947. The generic names of the mandrill and baboons, with notes on some of the genera of Brisson, 1762. Proc. Zool. Soc. London 117:533–536.

Kerr, R. 1792. The animal kingdom or zoological system of the Celebrated Sir Charles Linnaeus. Class I. Mammalia: Containing a complete systematic description, arrangement, and nomenclature, of all the known species and varieties of the Mammalia, or animals which give suck to their young; being a translation of that part of the Systema Naturae, as lately published, with great improvements, by Professor Gmelin of Goettingen. Together with numerous additions from more recent zoological writers, and illustrated with copperplates. A. Strahan and T. Cadell, London, and W. Creech, Edinburgh:i-xii, 1–400, 7 pls.

Linnaeus, C. 1758. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis, 1:1–824, i-iii (reprint ed. of 1894—"Cura Societatis Zoologicae Germanicae iterum edita").

Matschie, P. 1916. Bemerkungen über die Gattung *Didelphis* L. Sitzungsber. Gesellsch. naturforsch. Freunde Berlin, no. 8:259–272.

Miranda-Ribeiro, A. de. 1936. Didelphia ou mammalia-ovovivipara. Marsupiaes, didelphos, pedimanos ou metatherios. Rev. Museu Paulista 20:245–427, 7 figs., 1 map.

Pine, R. H. 1972. A new subgenus and species of murine opossum genus *Marmosa*) from Peru. J. Mamm. 53:279–282.

Rehn, J. A. G. 1900. On the Linnaean genera *Myrmecophaga* and *Didelphis*. American Naturalist 34:575–578.

Schreber, J. C. D. 1778. Die Säugthiere in Abbildungen nach der Natur mit Beschreibungen. Theil 3. Wolfgang Walther, Erlangen: 281–590, 106 pls.

Seba, A. 1734. Locupletissimi rerum naturalium thesauri accurata descriptio, et iconibus artificiosissimis expressio, per universam physices historiam opus, cui, in hoc rerum genere, nullum par exstitit. ex toto terrarum orbe collegit, digessit, descripsit, et depingendum curavit. Apud. J. Wetstenium, & Gul. Smith, & Janssonio-Waesbergios, Amstelaedami, 1:1–178 + 38 unnumbered pages, 111 pls.

Tate, G. H. H. 1939. The mammals of the Guiana region. Bull. Amer. Mus. Nat. Hist. 76, art. 5:151–229.

Temminck, C. J. 1824. Monographies de Mammalogie ou description de quelques genres de mammifères, dont les espèces ont été observées dans les différens musées de l'Europe. Chez G. Dufour et Ed. D'Ocagne, Libraires, Paris. i–xxxii, 1–72, 8 pls.

Thomas, O. 1888. Catalogue of the Marsupialia and Monotremata in the collection of the British Museum. London:i–xiii, 1–401, 28 pls.

Tiedemann, F. 1808. Zoologie. Zu seinen Vorlesungen entworfen. *1.* Allgemeine Zoologie, Mensch und Säugthiere. Landshut, in der Webersthen Buchhandlung:i–xvi, 1–610.

Tyson, E. 1698. Carigueya, *seu* marsupiale americanum. or, the anatomy *of an* opossum, dissected at Gresham-College *by* Edw. Tyson, M. D. Fellow of the College of Physicians, *and of* the Royal Society, *and reader of* Anatomy *at the* Chyrurgeons-Hall, *in* London. Philosophical Transactions 20(239):105–164, 2 pls.